

## 2.3 Solving Linear Inequalities

**M**any practical problems require solving linear inequalities. You can reason about inequalities, such as  $2x - 4 < 5$  or  $2x - 4 > -0.5x + 1$ , using both symbolic and graphic methods. Solutions to inequalities with one variable are generally given in the form  $x < a$ ,  $x > a$ ,  $x \leq a$ , or  $x \geq a$ .

### Getting Ready for Problem 2.3

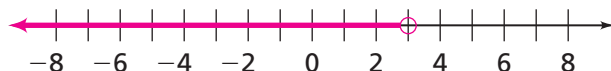
- What are some values that satisfy the inequality  $3x + 4 \leq 13$ ?
- Describe all the solutions of the inequality  $3x + 4 \leq 13$ .

All the solutions of  $3x + 4 \leq 13$  can be displayed in a number-line graph. This graph represents  $x \leq 3$ , all  $x$ -values less than or equal to 3.



- Explain why the solutions of  $3x + 4 < 13$  do *not* include the value 3.

The number-line graph below represents the solutions of  $3x + 4 < 13$ . It shows  $x < 3$ , all  $x$ -values strictly less than 3. The open circle shows that 3 is not a solution.



- Make a number-line graph showing the solutions of  $2x - 4 < 5$ .
- Explain in words what the graph tells about the solutions.

## Problem 2.3 Solving Linear Inequalities

**A.** Use symbolic reasoning to solve each inequality. Then make a number-line graph of the solutions. Be prepared to justify your solution steps and to explain your graphs.

1.  $3x + 17 < 47$

2.  $43 < 8x - 9$

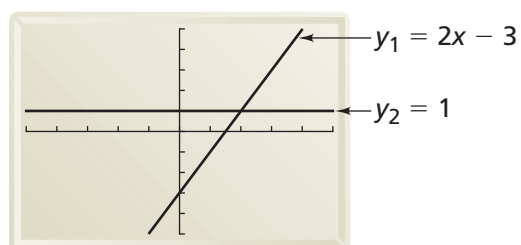
3.  $-6x + 9 < 25$

4.  $14x - 23 < 5x + 13$

5.  $18 < -4x + 2$

6.  $3,975 + 6d < 995 + 17.95d$

**B.** Luisa wants to use her graphing calculator to solve  $2x - 3 \leq 1$ . She graphs the linear functions  $y = 2x - 3$  and  $y = 1$ . She uses an  $x$ - and a  $y$ -scale of 1.



1. Luisa knows that the solution for  $2x - 3 = 1$  is  $x = 2$ . How does this relate to the graphs of the lines she drew?
2. How do the graphs show that the solution of  $2x - 3 \leq 1$  is  $x \leq 2$ ?
3. How can you use the graph to find the solution of  $2x - 3 > 1$ ? What is the solution?
4. For one of the inequalities in Question A, sketch a graph or use your graphing calculator to find the solution. Check that your solution agrees with the one you found by using symbolic reasoning.



**ACE** Homework starts on page 30.